of this interspace and the presence of pulmonary infection. Whether we may take the width of the 2d interspace as a basis for comparison is, however, open to argument.

Table IX.

Showing the Absence of any Relation Between the Angle of the 6th Rib and Pulmonary Tuberculosis.

Stages of Disease.	No. of Cases.	Angle of the 6th Rib. Average.	Max.	Min.
Neg.	36	100°	104	85
Doubt	35	97°	103	99
I Stage	9	101°	105	97
II Stage A	37	99°	104	97
II Stage B	16	100°	103	80
III Stage	22	97°	109	85

No very absolute measurements could be made of the angle of the ribs, but in Table IX we have recorded the average angle made by the spine and the sixth rib on the left side. Apparently no relation exists between this angle and pulmonary tuberculosis.

The position in which our cases were radiographed made it impossible to study the shape of the upper aperture and alterations in the angles of the neck muscles.

No definite conclusions were reached from our study of the height of the diaphragm, since the average height was about the same in the tuberculous and non-tuberculous cases and the variation in individual cases was very great. There are, however, several interesting features about the diaphragm shadow, especially the occurrence of irregularities, which are worthy of more extended consideration.

In conclusion, I believe I am justified in saying:

1. That the small pendulous heart, calcified cartilages, narrow interspaces, and excessive sloping of the ribs, are not only valueless, but are absolutely misleading, if considered as positive signs in the radiographic diagnosis of pulmonary tuberculosis.

2. That the hilus shadows and the fine markings in the lung fields are composite shadows cast by the bronchi, by the blood vessels with their contained blood, and by the fibrous and lymphatic tissues accompanying these structures.

3. That pulmonary tuberculosis produces alterations in these shadows as seen in stereo-roentgenographs which we believe to be characteristic of this disease.

4. And finally, that there can be no doubt of the great value of stereo-roentgenography as an aid in the diagnosis of pulmonary tuberculosis and other pulmonary affections when considered in connection with the history and physical examination.

Discussion.

Dr. Rene Bine: I wish first to congratulate Dr. Boardman upon the excellence of his work. I think the members of the Academy should be ashamed of themselves not to turn out to a larger extent and learn something on this subject, which is more or less new to most of us in the community. I was much impressed with Dr. Boardman's statement that the experts at the Phipps Institute found that the signs obtained on physical examination agreed pretty thoroughly with the X-ray findings. I think the X-ray has been of great value to most of us, and has proven a great stimulus to the average practitioner to do very accurate work in physical diagnosis because of his being frequently checked up by the X-ray. These pictures are certainly beautiful, and I think that we should give them greater study than is possible at this demonstration. I should like to ask what is the expense of this method as compared with the old.

Dr. Addis: I should like to hear Dr. Boardman's experience in comparing the findings of averagely skilful physical examination with the results of X-ray examination. It has seemed to me that in the hands of those who have not had a very large experience in physical examination, or who have not made a very special study of it, the tendency is rather to exaggerate the importance of slight variations in the quality of percussion resonance and breath sounds than to miss any signs really indicative of anatomical changes, and that thus one of the most important benefits for the ordinary man of X-ray examination of the chest is not so much to show him what he has missed as to let him see how much he has found which does not exist at all.

Dr. Spaulding: I wish to ask Dr. Boardman if there would be any improvement in the study of deformities of the pelvis by this means. The X-ray has been proven worthless in this work, even after marking with pieces of metal.

Dr. Boardman: In reply to Dr. Bine's question regarding expense, I may say that two plates are necessary by this method, but frequently two or more plates are required by the old method—so the expense is practically the same.

Regarding Dr. Addis's question, I believe that the X-ray usually discovers more disease than the clinical examination would lead one to expect, even with the most expert examination.

Replying to Dr. Spaulding's question regarding the measurement of the pelvis by means of stereo-roentgenography, this method has proven satisfactory. A report of the method may be found in the American Quarterly of Roentgenography, April, 1911, by W. F. Manges of Philadelphia.

TWO CASES OF CEREBELLAR DISEASE FOLLOWED BY AUTOPSY.*

By WALTER F. SCHALLER, M. D., San Francisco.

I wish to present the history of two cases of cerebellar disease, both of which came to autopsy. They represent two different types in their symptomatology: one was of sudden onset with no tendency towards a progressive course and with no evidence of intracranial pressure, while the other came on slowly and progressively with marked signs of intracranial pressure. In these two cases I wish to lay special stress on the analysis of the character of the ataxia.

Case 1, a boy aged 4½ years, was brought to the Stanford clinic complaining of difficulty in walking, of dizziness, of suddenly falling to the ground without loss of consciousness and of headache. First entering the children's clinic he was referred to the neurological clinic. About three months previously he had a fall from a height of 6 feet, striking on his head. This was followed by a nosebleed and some fever. The mother believed that the trouble, which had become progressively worse up to the present time, dated from this fall. Nothing of importance was brought out in the family history or the past history.

*Read before the San Francisco County Medical Society.

The examination showed an average sized boy for his age, fairly well developed and nourished. The speech was definitely scanning in character. The child laughed rather easily and there was at times the suggestion of Zwangslachen. The mother stated that the child had been of rather serious nature prior to his illness and believed that she noticed a change in this respect. It was noticed that the child tired easily at play and the mother said that she believed that he did not see so well as formerly. The walk was staggering in character and Romberg's symptom was present. Tests for ataxia in the upper extremity such as the finger-nose test were performed with moderate precision; in fact voluntary movements were relatively little affected as compared with the movements of equilibration. This was observed throughout the course of the disease. The tendinous reflexes were rather lively especially in the lower extremities. There was no clonus and the plantar reflex was in flexion. No disturbance of the sensibility was found. The pupils reacted to light and accommodation, the eye movements were normal and nystagmus was not noted. The corneal reflex was diminished on both sides. A fundus examination showed choked discs in both eyes. An examination of the remaining cranial nerves presented nothing abnormal. A radiograph of the skull showed nothing abnormal, the outlines in the occiput being very clearly seen. In the differential leukocyte count there was an eosinophilia of 8%. An examination of the stool showed no parasites or ova. The urine was normal. The Wassermann reaction was negative in the blood and in the spinal fluid. The spinal fluid was under considerable pressure but an analysis showed a normal content. The Moro tuberculin reaction was negative. Galvanic vertigo was found to be present as in the normal subject.

The following tests, proposed by Babinski for disturbed cerebellar function were applied and found present except as noted:

Movements démesurés. If the walk be analyzed it will be seen that exaggerated movements of the lower extremities are a factor in the production of the unsteady gait. Individual movements are well oriented and the sight does not influence the movement. This was shown in the Romberg test.

Asynergia. If, in the sitting position, the foot be raised to touch the hand of the examiner held at some distance above the floor, the thigh will first be flexed to the required height and then only will the leg be extended to complete the desired movement. There is then a dissociation between the movements of extension and flexion.

Catallepsie cérébelleuse. In the reclining position the legs could be held quite steadily raised above the body—this in marked contrast to the great ataxia on attempting to walk. True catallepsie as described by Babinski and as shown in my other case was not present.

Adiadokokenesis. The difficulty in getting the child to perform the movements necessary for the carrying out of this test did not enable us to determine definitely as to the presence of adiadokokenesis.

Pointing tests of Barany. These tests were gone over by Dr. H. B. Graham in the ear clinic. They were found to be normal. The cochlea and vestibular apparatus were intact. Dr. Graham found a spontaneous rotary intermittent nystagmus present on this examination, which I was not able to find on subsequent examinations. From the results of these tests Dr. Graham expressed the opinion that the condition was one of cerebellar tumor not cortical in origin.

It was noted that the child had a tendency to hold the head inclined forward on the chest. A sudden passive motion of the head did not appear to be followed by an unpleasant sensation. It was not noticed that when the child fell that it was more often in any one direction.

We considered the diagnosis in this case to lie between a serous meningitis with pressure symptoms and a cerebellar growth. In order to exclude the possibility of the former condition it was decided to perform the operation of Anton of Halle—draining the ventricular cavities in the subdural space by puncturing the corpus callosum. This was accordingly done by Dr. Sol Hyman on June 5. After the first effects of the operation had passed there was marked improvement subjectively and objectively. The headaches disappeared, the child was brighter, the walk improved somewhat and the choked discs cleared up so that the margins of the discs could be clearly outlined. The trouble in locomotion was always marked, however, and was relatively little improved compared with the other symptoms.

The improvement noted was but temporarv and on the 10th of August on account of a recurrence of the symptoms a diagnosis of cerebellar tumor was made and an operation to uncover the cerebellum was performed. This was to be done in two stages but the child died of shock following the first stage or the stage of decompression.

At the autopsy the cerebellum was found crowded down against the foramen magnum so that both tonsils of the cerebellum were pushed through it causing a deep groove on their surface. These markings are still plainly seen. Literally pressure grooves are also seen caused perhaps by the pressure of the sigmoid sinus. There was no projecting tumor mass on the surface of the cerebellum but it was noted that the region of the superior vermis was of a different color than the adjoining hemispheres, being of a much lighter color with an absence of definite markings. Section of the cerebellum showed a tumor mass—glioma—5-6 cm. in diameter with a cystic center which contained fluid under considerable pressure. The tumor mass involved the vermis and the white matter of the hemispheres adjoining including the dentate nuclei of both sides and extending into the central white matter of both superior peduncles. The superior worm was destroyed as was the inferior worm for the most part, only the inferior surface of the pyramid, uvula and the nodulus being intact. From the location of the growth and from its relation to the dentate nucleus the nucleii of the roof were unquestionably involved. Although the tumor mass approached the surface of the hemispheres to within 1 cm. of the surface posteriorly the striking part of the specimen is the conservation of the cerebellar cortex. This becomes of importance in referring back to the pointing tests of Barany which were not found to be abnormal; and the almost total destruction of the vermis is interesting in the light of the great disturbance of the function of equilibration and the relative conservation of the power of voluntary motor regulation as shown in the absence of any great ataxia in the finger nose tests.

The foramen of Megendie was patent and no basal meningitis or apendymitis was present.

Case 2. I will briefly present the second case history, laying special stress on the symptoms referable to the cerebellum. An intelligent man, aged 58, an inmate of the Relief Home, whose family history and past history present nothing of importance bearing on his condition, gave the following account of his illness:

In December, 1909, in Japan while sitting in front of a tea house in Yokohama he was suddenly seized with a sensation as if struck in the knees by a ball of lightning as he expressed it. He did not lose consciousness, was not dizzy and was able to walk a short distance unaided. He was put to bed and remained there a few days. Immediately following this stroke the trouble of which he now complains developed and has remained about the same in the three years which have elapsed. This trouble is chiefly the difficulty in controlling the movements of the left arm and leg, although the members on the right side of the body are also

affected to a lesser extent. Walking, or even standing, unsupported is impossible. He can feed himself but it is hard work. He has noticed that the character of the speech has changed, having become slow and deliberate, but there is no difficulty in articulation. The desire to urinate is imperative. He states that his memory has not suffered and that his mind is as clear as formerly. He has never had headaches or pain of any sort and he has not noticed that his strength has failed to any great extent. Vision for distance is good.

The status taken in December, 1911, showed a fairly well nourished man presenting a great incoordination of voluntary movements. To walk was impossible. Movements of the right upper extremity showed a moderate ataxia while coordinate movements of the left upper extremity were practically impossible. As it appeared to us that the type of ataxia was cerebellar in character special attention was paid to its study.

Movements démesurés. These movements were marked, in this case being evidenced by typical dysmetrie described by Thomas and Jumentié. When the patient attempted to place the finger on the tip of the nose the finger missed the mark by a wide margin, the movement being, nevertheless, well oriented and the error was of the same degree with or without the aid of the sight. In these two characteristics the ataxia was in marked contrast to the ataxia commonly seen in tabes.

Asynergia. This was present in the left lower extremity.

Catallepsie cérébelleuse. This was present in a very striking degree. In the reclining position the legs could be held elevated above the trunk quite motionless without a sign of the ataxia to be expected. Not only was there an absence of any oscillation but the members could retain this position for long periods without the usual fatigue constantly present in the normal subject.

Adiadokokenesis. This was marked in the left upper extremity. Successive pronation and supination of the left hand was impossible; in attempting this wide excursions of the forearm were made.

Pointing tests of Barany. There were no spontaneous errors in pointing. Pointing tests after turning by means of the rotary stool were not made. Among the signs of cerebellar disease was the scanning speech. This was a very prominent symptom in this case. There was, however, no difficulty in articulation. Voltaic vertigo was tested for. An interrupted current of from 14-16 m. a. was necessary to produce an inclination of the head, but it was always to the side of the positive pole.

It was not noticed that this patient had a tendency to fall particularly to one side when he lost his equilibrium nor was hypotonia present to any marked degree.

Reflexes: The radial, triceps, patellar and achilles reflexes were present on both sides and quite lively. The reflexes on the left side were found to be increased over those on the right. The plantar reflex was in flexion. The abdominal and cremasteric reflexes could not be elicited but the anal reflex was present.

The superficial sensibility was not affected and the sterognostic sense showed no impairment.

An examination of the cranial nerves showed very little. The pupils were equal in size and reacted to light, accommodation and convergence. The movements of the eyes were normal but it seemed to be an effort for the patient to look upwards and he complained of a pain in the back of the neck in attempting this movement. The fields of vision were apparently normal when tested roughly and there was no spontaneous nystagmus. The corneal reflex was perhaps a trifle diminished but distinctly present. The facial nerves were not involved. Hearing was diminished on both sides so that the ticking of a watch could only be heard in contact with the ear. There was no involvement of the 9, 10, 11 or 12 pair of cranial nerves.

On account of the history of sudden onset, the nature of the ataxia, and its prominence on the left side a diagnosis of a lesion of the left cerebellar hemisphere, vascular in origin was made.

The patient died suddenly on February 15, apparently from a stroke of apoplexy. At the autopsy when the brain was removed no tumor mass, thickening of membranes or adhesions were found, but it was noted that the left cerebellar hemisphere appeared smaller than the right and the corresponding posterior fossa of the skull was shallower than on the right side.

There was a marked arterio-sclerosis of the vessels at the base of the brain. The brain was hardened in formalin and afterwards placed in Muller's fluid. Sections showed two symmetrical areas of softening in the central white matter of both cerebellar hemispheres. The softening on the right side appeared recent. Another area of softening was found a little farther forward on the left side in external relation to the left superior peduncle. In hardening it will be seen that the inferior and superior peduncle on the left side have not taken on the brown color as on the opposite side. It would be premature to state positively before stained sections are made that these peduncles are degenerated but the gross specimen seems to indicate it. There was no evident lesion in any other portion of the brain.

In comparing the ataxia in these two cases it will be noted that the ataxia was far greater in this second case whereas the lesion was much less extensive. The question arises in this connection as to the result of slow or sudden destruction of cerebellar substance. In the case of sudden destruction as in softening it is possible that the coordinating function be permanently lost, while in the slower process the higher centers such as the cerebral hemispheres may assume this function by a process of reeducation.

Another question* is whether death by apoplexy may be caused by a lesion limited to the cerebellum. In the last case a complete autopsy was not performed so this point can not be settled in this particular case. In a case of chronic cerebro spinal meningitis observed recently, however, in which a complete autopsy was done the only lesion of sufficient importance to account for the sudden and unexpected death was a large area of softening in the roof of the 4 ventricle. This patient showed marked improvement in the meningeal symtoms prior to his death.

FACTORS IN THE PHYSIOLOGY OF BONE IN RELATION TO SURGERY.*

By ARTHUR L. FISHER, M. D., San Francisco.

My reason for presenting this paper at this time, is that it seemed to me from the discussions following Dr. Sherman's paper at the last

* Since the reading of this paper an article by Bernstein, "Kleinhirnblutung als Ursache plotzlichen Todes" (Deu. militararztl. Ztchr. No. 22, 1912. Abstracted in Deu. Med. Wochen. Dec. 12, 1912, p. 2379), dealing with this question has come to the notice of the author. A case is reported of death following a hemorrhage into one cerebellar hemisphere. Bernstein states that to his knowledge such a lesion has never been mentioned as a cause of death before, and he offers as an explanation secondary vascular disturbances in the nearby vessels of the medulla. This explanation would hardly be applicable to cases of softening. It seems to us more probable that in our cases where the lesion extended to both hemispheres the cause of death may be sought for in the loss of the co-ordinating function. In the case of cerebro-spinal meningitis mentioned above, bulbar paralysis appeared to be the direct cause of death.

* Read before the Surgical Section of the San Francisco County Medical Society, September 17th, 1912.